



SEQUENCE LISTING

<110> Black, Margaret E.

<120> THYMIDINE KINASE MUTANTS AND FUSION
PROTEINS HAVING THYMIDINE KINASE AND GUANYLATE KINASE
ACTIVITIES

<130> 240083.429

<140> US 09/173,463

<141> 1998-10-14

<160> 121

<170> FastSEQ for Windows Version 4.0

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<211> 1131

<212> DNA

<213> Herpesviridae sp.

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cgcctggagc agaaaatgcc cacgctactg cgggtttata tagacgggtcc tcacgggatg 180
gggaaaacca ccaccacgca actgctgggt gccctgggtt cgcgcgacga tatcgtctac 240
gtacccgagc cgatgactta ctggcagggt ctgggggctt ccgagacaat cgcgaacatc 300
tacaccacac aacaccgcct cgaccagggt gagatatcgg ccgggggacgc ggcggttgga 360
atgacaagcg cccagataac aatgggcatg ccttatgccg tgaccgacgc cgttctggct 420
cctcatatcg ggggggaggc tgggagctca catgccccgc ccccgccct caccctcatc 480
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tccatgcacg tctttatcct ggattacgac caatcgccg ccggtgccc ggacgcctg 1020
ctgcaactta cctccgggat ggtccagacc cacgtacca ccccggtc cataccgacg 1080
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<211> 52

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide for generation of TK mutants

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<221> misc_feature
 <222> (1)...(56)
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<210> 5
 <211> 17
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<400> 5
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<210> 6
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<220>
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<400> 6
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<210> 7
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<223> Primer

<400> 7

atgaggtacc g

11

<210> 8

<211> 52

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<223> Oligonucleotide for generation TK mutants

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<223> Oligonucleotide for generation TK mutants

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70

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<211> 38

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<213> Artificial Sequence

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<223> Oligonucleotide for generation TK mutants

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38

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<213> Artificial Sequence

<220>

<223> Primer

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catgccttat gccgtga

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<211> 33

<212> DNA

<213> Herpesviridae sp.

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<221> CDS

<222> (1)...(33)

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1 5 10

33

<210> 13

<211> 11

<212> PRT

<213> Herpesviridae sp.

<400> 13

Pro Ile Ala Ala Leu Leu Cys Tyr Pro Ala Ala
1 5 10

<210> 14

<211> 33

<212> DNA

<213> Artificial Sequence

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<223> HSVTK Mutant

<221> CDS

<222> (1)...(33)

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<211> 11

<212> PRT

<213> Artificial Sequence

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<223> HSVTK Mutant

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<210> 16

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<222> (1)...(33)

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Ser Ile Gly Ala Leu Gln Cys Tyr Pro Val Ala
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33

<210> 17

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<223> HSVTK Mutant

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Ser Ile Gly Ala Leu Gln Cys Tyr Pro Val Ala
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Pro Ile Ala Thr Leu Leu Cys Tyr Pro Ala Ala
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33

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<220>

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<221> CDS
 <222> (1)...(33)

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 Pro Ile Ala Ala Leu Leu Leu Tyr Pro Thr Ala
 1 5 10

33

<210> 21
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 <212> PRT
 <213> Artificial Sequence

<220>
 <223> HSVTK Mutant

<400> 21
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 1 5 10

<210> 22
 <211> 33
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 <213> Artificial Sequence

<220>
 <223> HSVTK Mutant

<221> CDS
 <222> (1)...(33)

<400> 22
 ccc atc gcc gcc ctc gtg tgc tac ccg gcc gcg
 Pro Ile Ala Ala Leu Val Cys Tyr Pro Ala Ala
 1 5 10

33

<210> 23
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 <212> PRT
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<400> 23

Pro Ile Ala Ala Leu Val Cys Tyr Pro Ala Ala
1 5 10

<210> 24

<211> 58

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide for generation of TK Mutants

<221> misc_feature

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<211> 51

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide for generation of TK Mutants

<221> misc_feature

<222> (1)...(51)

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<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 26

actactggat ccatggcggg cccaggcct gtg 33

<210> 27

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 27

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33

<210> 28

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 28

ctgctgaaga ggctgctc

18

<210> 29

<211> 19

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 29

acacagatgc ggtttcatg

19

<210> 30

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 30

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<210> 31

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 31

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18

<210> 32

<211> 18

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<213> Artificial Sequence

<220>

<223> Primer

<400> 32
tgtaaaacga cggccagt 18

<210> 33
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<212> DNA
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<220>
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<400> 33
caggaaacag ctatgacc 18

<210> 34
<211> 21
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<400> 34
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<210> 35
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<220>
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<400> 35
tgagaactca gcagcatgct c 21

<210> 36
<211> 18
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<400> 36
gtgctagatg tcgaccta 18

<210> 37
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 37
acctggataa agcctatg 18

<210> 38
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Primer

<400> 38
aagcaggcgc tctctctga 19

<210> 39
<211> 18
<212> DNA
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<220>
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<400> 39
ctatttctca tatgatgt 18

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<220>
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<400> 40
gttacagtgt ctctagag 18

<210> 41
<211> 24
<212> DNA
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<220>
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<400> 41
ctaggtcctg ccatggcgtc cgcg 24

<210> 42
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<220>

<223> Primer

<400> 42

actactacta gatctcgatc ccgcgaa

27

<210> 43

<211> 41

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 43

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<210> 44

<211> 39

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 44

cggcaccagg ccgctgctgt gatgatgatg atgatggct

39

<210> 45

<211> 42

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 45

agtagtatcc atggagctgc cgcgcggcac caggccgctg ct

42

<210> 46

<211> 21

<212> PRT

<213> Artificial Sequence

<220>

<223> Vector fusion peptide

<400> 46

Met	Ala	Ser	Ser	His	His	His	His	His	His	Ser	Ser	Gly	Leu	Val	Pro
1				5				10					15		
Arg	Gly	Ser	Ser	Met											
				20											

<210> 47

<211> 19

<212> PRT
 <213> Herpesviridae sp.

<400> 47
 Ala Leu Thr Leu Ile Phe Asp Arg His Pro Ile Ala Ala Leu Leu Cys
 1 5 10 15
 Tyr Pro Ile

<210> 48
 <211> 606
 <212> DNA
 <213> Homo sapiens

<220>
 <221> CDS
 <222> (7)...(597)

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 Met Ala Gly Pro Arg Pro Val Val Leu Ser Gly Pro Ser Gly
 1 5 10

gct ggg aag agc acc ctg ctg aag agg ctg ctc cag gag cac agc ggc 96
 Ala Gly Lys Ser Thr Leu Leu Lys Arg Leu Leu Gln Glu His Ser Gly
 15 20 25 30

atc ttt ggc ttc agc gtg tcc cat acc acg agg aac ccg agg ccc ggc 144
 Ile Phe Gly Phe Ser Val Ser His Thr Thr Arg Asn Pro Arg Pro Gly
 35 40 45

gag gag aac ggc aaa gat tac tac ttt gta acc agg gag gtg atg cag 192
 Glu Glu Asn Gly Lys Asp Tyr Tyr Phe Val Thr Arg Glu Val Met Gln
 50 55 60

cgt gac ata gca gcc ggc gac ttc atc gag cat gcc gag ttc tcg ggc 240
 Arg Asp Ile Ala Ala Gly Asp Phe Ile Glu His Ala Glu Phe Ser Gly
 65 70 75

aac ctg tat ggc acg agc aag gtg gcg gtg cag gcc gtg cag gcc atg 288
 Asn Leu Tyr Gly Thr Ser Lys Val Ala Val Gln Ala Val Gln Ala Met
 80 85 90

aac cgc atc tgt gtg ctg gac gtg gac ctg cag ggt gtg cgg aac atc 336
 Asn Arg Ile Cys Val Leu Asp Val Asp Leu Gln Gly Val Arg Asn Ile
 95 100 105 110

aag gcc acc gat ctg cgg ccc atc tac atc tct gtg cag ccg cct tca 384
 Lys Ala Thr Asp Leu Arg Pro Ile Tyr Ile Ser Val Gln Pro Pro Ser
 115 120 125

ctg cac gtg ctg gag cag cgg ctg cgg cag cgc aac act gaa acc gag 432
 Leu His Val Leu Glu Gln Arg Leu Arg Gln Arg Asn Thr Glu Thr Glu
 130 135 140

gag agc ctg gtg aag cgg ctg gct gct gcc cag gcc gac atg gag agc 480
 Glu Ser Leu Val Lys Arg Leu Ala Ala Ala Gln Ala Asp Met Glu Ser
 145 150 155

agc aag gag ccc ggc ctg ttt gat gtg gtc atc att aac gac agc ctg 528
 Ser Lys Glu Pro Gly Leu Phe Asp Val Val Ile Ile Asn Asp Ser Leu
 160 165 170

gac cag gcc tac gca gag ctg aag gag gcg ctc tct gag gaa atc aag 576
 Asp Gln Ala Tyr Ala Glu Leu Lys Glu Ala Leu Ser Glu Glu Ile Lys
 175 180 185 190

aaa gct caa agg acc ggc gcc tgaggatcc 606
 Lys Ala Gln Arg Thr Gly Ala
 195

<210> 49
 <211> 197
 <212> PRT
 <213> Homo sapiens

<400> 49
 Met Ala Gly Pro Arg Pro Val Val Leu Ser Gly Pro Ser Gly Ala Gly
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 Lys Ser Thr Leu Leu Lys Arg Leu Leu Gln Glu His Ser Gly Ile Phe
 20 25 30
 Gly Phe Ser Val Ser His Thr Thr Arg Asn Pro Arg Pro Gly Glu Glu
 35 40 45
 Asn Gly Lys Asp Tyr Tyr Phe Val Thr Arg Glu Val Met Gln Arg Asp
 50 55 60
 Ile Ala Ala Gly Asp Phe Ile Glu His Ala Glu Phe Ser Gly Asn Leu
 65 70 75 80
 Tyr Gly Thr Ser Lys Val Ala Val Gln Ala Val Gln Ala Met Asn Arg
 85 90 95
 Ile Cys Val Leu Asp Val Asp Leu Gln Gly Val Arg Asn Ile Lys Ala
 100 105 110
 Thr Asp Leu Arg Pro Ile Tyr Ile Ser Val Gln Pro Pro Ser Leu His
 115 120 125
 Val Leu Glu Gln Arg Leu Arg Gln Arg Asn Thr Glu Thr Glu Glu Ser
 130 135 140
 Leu Val Lys Arg Leu Ala Ala Ala Gln Ala Asp Met Glu Ser Ser Lys
 145 150 155 160
 Glu Pro Gly Leu Phe Asp Val Val Ile Ile Asn Asp Ser Leu Asp Gln
 165 170 175
 Ala Tyr Ala Glu Leu Lys Glu Ala Leu Ser Glu Glu Ile Lys Lys Ala
 180 185 190
 Gln Arg Thr Gly Ala
 195

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 <211> 660
 <212> DNA

<213> Mus musculus

<220>

<221> CDS

<222> (25)...(618)

<400> 50

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agc ggg ccg tca ggg gca ggg aag agc act ctg ctc aag aag ctg ttc	99
Ser Gly Pro Ser Gly Ala Gly Lys Ser Thr Leu Leu Lys Lys Leu Phe	
10 15 20 25	
cag gag cac agc agc atc ttc ggc ttc agt gtg tcc cat act aca agg	147
Gln Glu His Ser Ser Ile Phe Gly Phe Ser Val Ser His Thr Thr Arg	
30 35 40	
aac cca cga cct ggt gaa gaa gat ggc aaa gat tac tac ttt gtg acc	195
Asn Pro Arg Pro Gly Glu Glu Asp Gly Lys Asp Tyr Tyr Phe Val Thr	
45 50 55	
agg gag atg atg cag cgt gat att gca gca ggg gac ttc att gag cat	243
Arg Glu Met Met Gln Arg Asp Ile Ala Ala Gly Asp Phe Ile Glu His	
60 65 70	
gct gag ttc tca ggg aac ctg tac ggg aca agc aag gaa gct gtt cgg	291
Ala Glu Phe Ser Gly Asn Leu Tyr Gly Thr Ser Lys Glu Ala Val Arg	
75 80 85	
gct gtg cag gcc atg aac cgc atc tgc gtg cta gat gtc gac cta caa	339
Ala Val Gln Ala Met Asn Arg Ile Cys Val Leu Asp Val Asp Leu Gln	
90 95 100 105	
ggc gtg cgc agc atc aag aag act gat ctg tgt ccc atc tac atc ttt	387
Gly Val Arg Ser Ile Lys Lys Thr Asp Leu Cys Pro Ile Tyr Ile Phe	
110 115 120	
gtg cag cct ccc tcg ctg gac gtg ctg gag caa cga ctg cga ctg cgc	435
Val Gln Pro Pro Ser Leu Asp Val Leu Glu Gln Arg Leu Arg Leu Arg	
125 130 135	
aac act gag act gag gag agt ctg gca aag cgg ctg gca gct gca cgg	483
Asn Thr Glu Thr Glu Glu Ser Leu Ala Lys Arg Leu Ala Ala Ala Arg	
140 145 150	
aca gac atg gag agc agc aag gag cct ggc ttg ttt gac ctg gtg atc	531
Thr Asp Met Glu Ser Ser Lys Glu Pro Gly Leu Phe Asp Leu Val Ile	
155 160 165	
atc aat gac gac ctg gat aaa gcc tat gca acc ctg aag cag gcg ctc	579
Ile Asn Asp Asp Leu Asp Lys Ala Tyr Ala Thr Leu Lys Gln Ala Leu	
170 175 180 185	

tct gag gaa atc aag aaa gca cag gga act ggc cac gcc tgaaggcctg 628
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 190 195

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<210> 51
 <211> 198
 <212> PRT
 <213> Mus musculus

<400> 51
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 Gly Phe Ser Val Ser His Thr Thr Arg Asn Pro Arg Pro Gly Glu Glu
 35 40 45
 Asp Gly Lys Asp Tyr Tyr Phe Val Thr Arg Glu Met Met Gln Arg Asp
 50 55 60
 Ile Ala Ala Gly Asp Phe Ile Glu His Ala Glu Phe Ser Gly Asn Leu
 65 70 75 80
 Tyr Gly Thr Ser Lys Glu Ala Val Arg Ala Val Gln Ala Met Asn Arg
 85 90 95
 Ile Cys Val Leu Asp Val Asp Leu Gln Gly Val Arg Ser Ile Lys Lys
 100 105 110
 Thr Asp Leu Cys Pro Ile Tyr Ile Phe Val Gln Pro Pro Ser Leu Asp
 115 120 125
 Val Leu Glu Gln Arg Leu Arg Leu Arg Asn Thr Glu Thr Glu Glu Ser
 130 135 140
 Leu Ala Lys Arg Leu Ala Ala Ala Arg Thr Asp Met Glu Ser Ser Lys
 145 150 155 160
 Glu Pro Gly Leu Phe Asp Leu Val Ile Ile Asn Asp Asp Leu Asp Lys
 165 170 175
 Ala Tyr Ala Thr Leu Lys Gln Ala Leu Ser Glu Glu Ile Lys Lys Ala
 180 185 190
 Gln Gly Thr Gly His Ala
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<220>
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<210> 53
 <211> 18
 <212> DNA

<213> Artificial Sequence

<220>

<223> Primer

<400> 53

ctcagtgttg cccagtcg

18

<210> 54

<211> 18

<212> DNA

<213> Artificial Sequence

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<223> Primer

<400> 54

gccgaagatg ctgctgtg

18

<210> 55

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<221> CDS

<222> (1)...(33)

<400> 55

ccc atc gcc gcc ctc atc tgc tac ccg gcc gcg

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Pro Ile Ala Ala Leu Ile Cys Tyr Pro Ala Ala

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<210> 56

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 56

Pro Ile Ala Ala Leu Ile Cys Tyr Pro Ala Ala

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5

10

<210> 57

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<221> CDS

<222> (1)...(33)

<400> 57

cac atc tcg gcc ctc ctg tgc tac ccg gtc gcg
His Ile Ser Ala Leu Leu Cys Tyr Pro Val Ala
1 5 10

33

<210> 58

<211> 11

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 58

His Ile Ser Ala Leu Leu Cys Tyr Pro Val Ala
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<210> 59

<211> 72

<212> DNA

<213> Herpesviridae sp.

<220>

<221> CDS

<222> (1)...(72)

<400> 59

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Ser His Ala Pro Pro Pro Ala Leu Thr Leu Ile Phe Asp Arg His Pro
1 5 10 15

48

atc gcc gcc ctc ctg tgc tac ccg
Ile Ala Ala Leu Leu Cys Tyr Pro
20

72

<210> 60

<211> 24

<212> PRT

<213> Herpesviridae sp.

<400> 60

Ser His Ala Pro Pro Pro Ala Leu Thr Leu Ile Phe Asp Arg His Pro
1 5 10 15
Ile Ala Ala Leu Leu Cys Tyr Pro
20

<210> 61

<211> 72
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<220>
 <223> HSVTK Mutant

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 ttatgctacc cg 72

<210> 62
 <211> 72
 <212> DNA
 <213> Artificial Sequence

<220>
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<400> 62
 tcacatgccc cgccccctgc cctcaccgta ataacagacc gccatcccat cgccctgcctg 60
 ctttgctacc cg 72

<210> 63
 <211> 72
 <212> DNA
 <213> Artificial Sequence

<220>
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<400> 63
 tcacatgccc cgcccccggc cctcaccta ctactggacc gccatcccat cgccgtgatg 60
 ctatgctacc cg 72

<210> 64
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 <212> DNA
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<220>
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 tgttgctacc cg 72

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<220>
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 gtatgctacc cg 72

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 taccg 66

<210> 67
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<220>
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<400> 67
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 tgctaccg 69

<210> 68
 <211> 72
 <212> DNA
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<220>
 <223> HSVTK Mutant

<400> 68
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 tgttgctacc cg 72

<210> 69
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 <212> DNA
 <213> Artificial Sequence

<220>
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<400> 69
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 tgctaccct 69

<210> 70

<211> 69
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<210> 71
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<400> 71
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 1 5 10 15

<210> 73
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 1 5 10 15

<210> 74
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<210> 75
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 1 5 10 15

<210> 76
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 <212> PRT
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 1 5 10 15

<210> 77
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 1 5 10 15

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<210> 79
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<400> 79

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<210> 80

<211> 15

<212> PRT

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<400> 80

Leu	Cys	Phe	Asp	Arg	His	Pro	Ile	Ala	Tyr	Cys	Ile	Cys	Tyr	Pro
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<210> 81

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<212> PRT

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<400> 81

Ile	Ile	Ala	Asp	Arg	His	Pro	Ile	Ala	Leu	Leu	Val	Cys	Tyr	Pro
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<210> 82

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 82

Leu	Ile	Leu	Asp	Arg	His	Pro	Ile	Ala	Val	Ser	Leu	Cys	Tyr	Pro
1					5				10					15

<210> 83

<211> 15

<212> PRT

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<220>

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<400> 83

Leu	Leu	His	Asp	Arg	His	Pro	Ile	Ala	Val	Cys	Val	Cys	Tyr	Pro
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1	5	10	15
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<210> 84
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 <213> Artificial Sequence

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 1 5 10 15

 <210> 85
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 <400> 85
 Phe Leu Val Asp Arg His Pro Ile Ala Trp Asn Leu Cys Tyr Pro
 1 5 10 15

 <210> 86
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 Thr Val Phe Asp Arg His Pro Ile Ala Ser Thr Phe Cys Tyr Pro
 1 5 10 15

 <210> 87
 <211> 15
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 Leu Thr Phe Asp Arg His Pro Ile Ala Gly Thr Leu Cys Tyr Pro
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 <210> 88
 <211> 15
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<220>

<223> HSVTK Mutant

<400> 88

Leu Phe Ile Asp Arg His Pro Ile Ala Thr Ile Leu Cys Tyr Pro
1 5 10 15

<210> 89

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 89

Val Ala Ala Asp Arg His Pro Ile Ala Phe Ser Tyr Cys Tyr Pro
1 5 10 15

<210> 90

<211> 15

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<220>

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<400> 90

Pro Thr Gln Asp Arg His Pro Ile Ala Ser Asp Pro Cys Tyr Pro
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<210> 91

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 91

Arg Ala Phe Asp Arg His Pro Ile Gly Gln Thr Ser Cys Tyr Pro
1 5 10 15

<210> 92

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 92

Asp Gly Val Asp Arg His Pro Ile Ala Cys Arg His Cys Tyr Pro

1	5	10	15
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<210> 93
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<220>
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<400> 93
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 1 5 10 15

<210> 94
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 <212> PRT
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<220>
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<400> 94
 Ile Leu Asn Asp Arg His Pro Ile Ala Arg Thr
 1 5 10

<210> 95
 <211> 15
 <212> PRT
 <213> Artificial Sequence

<220>
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<400> 95
 Phe Leu Asp Asp Arg His Pro Ile Ala Pro Leu Leu Cys Tyr Pro
 1 5 10 15

<210> 96
 <211> 15
 <212> PRT
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<220>
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<400> 96
 Tyr Tyr Val Asp Arg His Pro Ile Ala Val Ser Leu Cys Tyr Pro
 1 5 10 15

<210> 97
 <211> 12
 <212> PRT
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<220>

<223> HSVTK Mutant

<400> 97

Asp Arg His Pro Ile Ala Leu Arg Ser Cys Asn Pro
1 5 10

<210> 98

<211> 15

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 98

Leu Asn Pro Asp Arg His Pro Ile Ala Cys Asp Cys Cys Tyr Pro
1 5 10 15

<210> 99

<211> 12

<212> PRT

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<223> HSVTK Mutant

<400> 99

Ser Trp Gly Asp Arg His Pro Ile Glu Lys Phe Ile
1 5 10

<210> 100

<211> 15

<212> PRT

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<220>

<223> HSVTK Mutant

<400> 100

Tyr Gly Ser Asp Arg His Pro Ile Ala Ile Cys Pro Cys Tyr Pro
1 5 10 15

<210> 101

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> HSVTK Mutant

<400> 101

Asp Arg His Pro Ile Ala Ile Ile

1 5

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<220>
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<400> 102
 Tyr Tyr Asn Asp Arg His Pro Ile Ala Gly Ser Pro Cys Tyr Pro
 1 5 10 15

<210> 103
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 <212> PRT
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<220>
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<400> 103
 Trp Gly Arg Asp Arg His Pro Ile Ala Asn Leu Leu Cys Tyr Pro
 1 5 10 15

<210> 104
 <211> 15
 <212> PRT
 <213> Artificial Sequence

<220>
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<400> 104
 Arg Leu Pro Asp Arg His Pro Ile Ala Asn Glu Ala Cys Tyr Pro
 1 5 10 15

<210> 105
 <211> 12
 <212> PRT
 <213> Herpesviridae sp.

<400> 105
 Leu Ile Phe Asp Arg His Pro Ile Ala Ala Leu Leu
 1 5 10

<210> 106
 <211> 12
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> HSVTK Mutant

<400> 106
Leu Phe Leu Asp Arg His Pro Ile Ala Phe Asn Leu
1 5 10

<210> 107
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> HSVTK Mutant

<400> 107
Leu Phe Ala Asp Arg His Pro Ile Ala Phe Leu Leu
1 5 10

<210> 108
<211> 12
<212> PRT
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<220>
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<400> 108
Ile Phe Leu Asp Arg His Pro Ile Ala Phe Met Leu
1 5 10

<210> 109
<211> 12
<212> PRT
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<220>
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<400> 109
Ile Leu Leu Asp Arg His Pro Ile Ala Tyr Leu Leu
1 5 10

<210> 110
<211> 12
<212> PRT
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<220>
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<400> 110
Leu Phe Ala Asp Arg His Pro Ile Ala Tyr Tyr Leu
1 5 10

<210> 111

<211> 12
 <212> PRT
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<220>
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<400> 111
 Leu Phe Val Asp Arg His Pro Ile Ala Val Met Leu
 1 5 10

<210> 112
 <211> 12
 <212> PRT
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<220>
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<400> 112
 Ile Phe Val Asp Arg His Pro Ile Ala Phe Tyr Leu
 1 5 10

<210> 113
 <211> 21
 <212> DNA
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<220>
 <223> Primer

<400> 113
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21

<210> 114
 <211> 59
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Oligonucleotide used to generate TK mutants

<400> 114
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59

<210> 115
 <211> 54
 <212> DNA
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<220>
 <223> Oligonucleotide used to generate TK mutants

<400> 115

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<210> 116

<211> 55

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide used to generate TK mutants

<400> 116

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<210> 117

<211> 58

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide used to generate TK mutants

<400> 117

gaacggcgtc ggtcacggca taaggcatgc ccattgttat ctgggcgctt gtcattac 58

<210> 118

<211> 60

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide used to generate TK mutants

<400> 118

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<210> 119

<211> 59

<212> DNA

<213> Artificial Sequence

<220>

<223> Oligonucleotide used to generate TK mutants

<400> 119

tcgactgagc tccagcctc cccccgata tgaggagcca gaacggcgtc ggtcacggc 59

<210> 120

<211> 24

<212> DNA

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<220>

<223> Oligonucleotide used to generate TK mutants

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24

<210> 121
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide used to generate TK mutants

<400> 121
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19

B11
Cont